

# Network for Cooperation in Integrated Water Resource Management for Sustainable Development in Latin America and the Caribbean



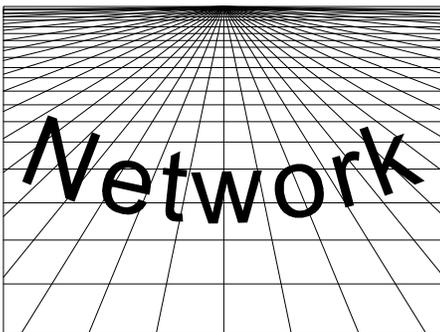
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The design of appropriate water management systems is an issue of huge importance and of particular interest to ECLAC, which has accordingly given many countries technical advisory assistance in the formulation and implementation of laws, regulations and public policies concerning water resources. The rationale underpinning this has always been that the sustainable integration of water resources into the economy and society depends on achieving the right balance between public, environmental, economic, social and private interests.



Firstly, a system of stable water rights incentivizes investment to develop the economic potential of the resource and conserve it. This stability is a fundamental principle of water legislation. The inability to grant stable water rights is known to hinder development. The stability and security of water rights and the associated uses are thus a hallmark of established economies and serve to forestall social discontent.

It is clear that neither the supply of nor the demand for water is constant: uses change, populations move, the economy is dynamic and the climate is ever-changing. A system of water rights must therefore be flexible in order to respond to needs in changing situations. In principle, a system of water markets should be an efficient mechanism for ensuring that this resource is available for new uses in a context of growing and increasingly complex demand. Such a system also promotes economic development, since it enables a valuable and scarce resource to be

reallocated away from less efficient uses and towards higher-value ones.

The stability and flexibility of water rights are key factors in investment decisions by economic actors when it comes to developing the economic potential of this resource. Legislation therefore plays a socioeconomic engineering role of structural importance, since it determines how people and corporations relate to productive resources.

Secondly, and very importantly, water has physical and economic characteristics that influence the design of systems for its management: it is a resource in constant flux with great potential to generate or mediate the transfer of externalities, it plays a crucial ecological and social role, and it is capable of multiple use, if properly planned. Moreover, its great diversity of constantly changing uses must be met from an unpredictable supply, and it is not easily divisible or clearly delimited, unlike many other goods and services.

Because of these characteristics, water legislation seeks to ensure that investment is underpinned by stable water rights and efficiency by functioning markets, and it does this by incorporating a number of regulatory elements designed to ensure sustainable utilization, prevent the transfer of negative externalities, promote the efficient and orderly use of water, safeguard its ecological and social role and prevent monopolies and speculation. These regulatory elements include the following:

- The administration of a system of water rights and markets requires a strong water authority with trained staff, a stable institutional framework, real autonomy, and powers and resources commensurate with its responsibilities. Given the technical complexities of managing water resources, it is advisable for the authority to be given an important role in settling water-related conflicts, especially those whose resolution requires specific professional knowledge.

- Without robust monitoring, measurement, record-keeping and registration systems, it is impossible to manage a scarce and valuable resource or safeguard individuals' rights over it, let alone prevent the transfer of negative externalities. Nor can this be achieved without appropriate incentives and penalties. The water authorities must also have the requisite operational and financial capabilities to properly fulfil their management responsibilities.

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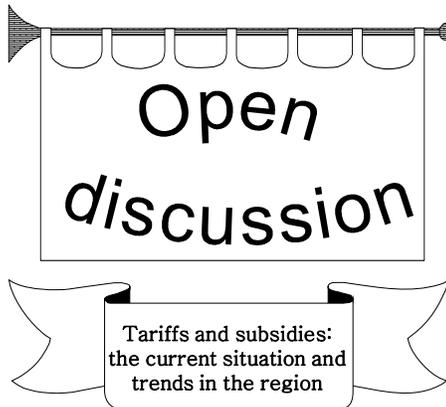
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- Experience also shows that the costs of proper administration can only be covered by ensuring that the water authority has an independent source of funding under its control, such as charges for water use.
- Lastly, and perhaps most importantly, if effective and beneficial use of the resource is not the basis of water rights, negative externalities will inevitably affect the resource base, the sustainability of water uses and social stability, and speculation and monopolization will be facilitated.

Both the challenge and the virtue of water law is to strike the right balance between structural rules designed to preserve the stability and flexibility of water rights, on the one hand, and regulations aimed at ensuring that uses are sustainable and preventing the transfer of negative externalities, the formation of monopolies and speculation, on the other. Thus, structural rules must not give rise to monopolies or jeopardize sustainability, and regulations must not stifle economic development.

In short, the aim must be to move towards better systems of water governance, by which is meant the ability of society to mobilize its energies consistently so that water can be integrated sustainably into socioeconomic development. Governance entails the ability to design public policies that are socially accepted and ensure they are implemented by the various stakeholders involved. Consensus-building and dialogue are essential tools in the effort to promote a broad-based commitment to improving governance and meeting the objectives of development, sustainability, inclusion and equity, with a more balanced relationship between the State, the market, water users and citizens.

Andrei S. Jouravlev



We shall now present the conclusions of the Meeting of Experts on Tariff and Regulatory Policies in the framework of the Millennium Development Goals (MDGs) and the Human Right to Water and Sanitation (see Circular No. 39) in respect of the **current situation and trends in the region regarding tariffs and subsidies** for drinking water supply and sanitation services.

The various tariff models were analysed and the tariff levels and degree of self-sufficiency of different utilities were evaluated with a view to identifying trends in Latin America. Given the disparities both in the size and development level of services and in socioeconomic conditions, a sample was taken representing a large number of countries in the region, of all sizes and levels of development. The analysis covered a group of 15 service providers in 10 countries. Although the sample covers about 100 million urban consumers in the region, it is not intended to

be statistically representative, and it presents some problems of data consistency. The comparisons are nonetheless useful for ascertaining regional trends and, on the whole, confirm empirical assumptions.

As far as the design of tariff structures is concerned, a great variety of systems were found, several of which were unnecessarily complicated. Most of the utilities surveyed use increasing block rate structures, differentiated by categories of users (higher rates for non-residential users). Rates charged for sewerage are almost invariably a multiple of drinking water charges, but with surprisingly large variations in the percentages applied.

The situation in Chile, Argentina and Uruguay differs somewhat from that in the region at large. Chile, the only country in which there is no distinction between user categories, uses two-part linear tariffs with seasonal adjustments. The special feature of Argentina is that the great majority of customers are unmetered, and this has led to the use of a pricing formula based on surface area that incorporates cross-subsidies. Lastly, Uruguay uses an increasing block structure for residential customers, while rates for commercial and industrial users fall as consumption volume rises.

As for subsidy mechanisms, the simplest and most distinct model is to be found in Chile, where a means-tested direct subsidy is used. Argentina and Uruguay are at the other extreme, applying a wide variety of subsidy types, including direct subsidies, different cross-subsidies and connection charge subsidies. The vast majority of pricing systems cross-subsidize between categories of customers (non-residential to residential), and in several cases afford preference to poorer groups of residential customers. Colombia has a unique model (although resembling in certain respects the system applied in Ecuador) of cross-subsidies differentiated by social stratum, determined on a geographical basis (which correlates with the socioeconomic characteristics of inhabitants).

Using cost coverage indicators is a helpful way of identifying trends in tariff levels and the extent to which they are self-sustaining. The use of ratios avoids the need for comparisons of absolute values in different currencies or their conversion into a common currency, which would create comparability problems as a result of differences in purchasing power parity, among other things. Three variants of this indicator were calculated, with total income being taken as the numerator in each case, but with different denominators:

- **Operational coverage**, which only considers operating expenses.

- **Basic financial coverage**, which adds depreciation.
- **Substantive financial coverage**, which also includes debt interest payments.

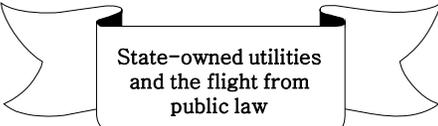
The tendency in the region is for charges to be set at a level that covers operating costs. This is most prevalent among utilities in Chile, followed by those in Brazil and Peru, and then, at some distance, Colombia, Costa Rica, Ecuador, Paraguay and Uruguay. Utilities in Argentina are at the other end of the spectrum.

This evaluation of tariff system efficiency was continued by introducing physical parameters such as the amount of consumption, metering, losses in the network and service coverage. The main findings were as follows:

- **Average monthly consumption is 22 cubic metres of water per customer, and 38% of production is lost in the network.** The average monthly bill for this consumption is US\$ 28, or US\$ 1.65 per cubic metre. Some 83% of customers are metered, and dividing revenues by operating expenses yields a ratio of 132%, falling to 111% if the denominator includes depreciation and 108% if interest payments are added.
- **There is some correlation between low consumption and high tariffs.** The correlation between consumption in cubic metres per month and the tariff per cubic metre is negative (consistent with relatively low negative elasticity).
- **Metering is correlated with low consumption.** The simple correlation between the variables is also negative. This is consistent with the fact that metering helps keep down consumption, especially since metering levels are positively correlated with the average tariff: that is, service providers that meter more charge higher tariffs.
- **There is some correlation between lower losses and a higher prevalence of metering.** The simple correlation between losses and metering is negative, meaning that metering helps keep down losses.
- **The greater the financial coverage, the higher the average tariff or bill.** The simple correlation between financial coverage and the average bill is positive, both when depreciation is excluded and when depreciation and interest are included (higher tariffs contribute to sustainability).
- **The better costs are covered, the higher the percentage of the population served.** The correlation between drinking water coverage and the three cost coverage indicators is positive. This means that the

ability to cover costs is also conducive to the expansion of service coverage (resources that would have gone to cover costs can be invested in infrastructure) and that when a larger population is served, the greater number of users results in improved economic and financial sustainability ratios since, for example, fixed costs are spread among more users.

*Emilio Lentini and Gustavo Ferro*



**State-owned utilities  
and the flight from  
public law**

A pivotal element in the debate on the institutional structure of publicly owned drinking water and sanitation utilities is the controversy around the organizational trend known as the “flight from public law”. This occurs when the State makes use of business or corporate structures to circumvent the constraints of public administration by having certain tasks discharged by bodies that are not bound by the rules governing State administration, being subject to private law.

The theoretical objective is to afford these companies more operational flexibility and thereby achieve higher levels of efficiency than under State administration. Another major practical justification is to mitigate the brain drain to the private sector, as more competitive salaries can be paid when the pay caps that usually apply in the public sector are avoided.

One of the greatest points of contention over exemption from the rules of public law concerns public procurement regulations, since bodies that operate in this way under private law despite carrying out public service tasks, managing public funds and ultimately answering to the State are not bound by the same constraints as the State in its dealings with third parties. The result is less stringent controls and safeguards on the disposal of assets and the selection of contractors and staff generally, which leads to the risk of misappropriation and capture of the firm by interest groups. The main agency problems in this field are associated with undue interference in company management by political actors who, in partnership with trade unions and suppliers, end up prioritizing short-term objectives and driving down tariffs to artificially low levels, employing unnecessary numbers of staff or reallocating funds to other areas of government, all of which compromises the sustainability and quality of service provision and reduces the scope for expanding service coverage to low-income groups.

From the point of view of their detractors, the proliferation of public bodies subject to private law is the result of an instrumental and tactical use of commercial law that enables

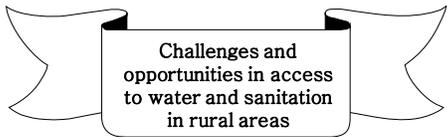
them to enjoy the benefits of both the public (prerogatives, State-guaranteed solvency and the absence of risk) and the private (freedom of action, decision-making autonomy) sector without the drawbacks. Far from boosting efficiency, this equation creates an “incentive gap” that ultimately undermines it: the market cannot provide incentives because these companies’ status insulates them from business risk, and the rules of public administration cannot fill the void because they have been declared inapplicable.

In recent years, globalization has added two crucial components to the debate on the advantages and disadvantages of the techniques used to circumvent public law. Firstly, the State has much less room for manoeuvre in drawing up goods and services procurement policies than it did in the mid-twentieth century heyday of the public enterprise, owing to the international commitments accepted by most of the countries of the region under the Inter-American Convention against Corruption and the United Nations Convention against Corruption. These agreements, which are part of a wider global trend towards expanding public monitoring mechanisms, contain rules to prevent the evasion of minimum public procurement standards. In this new context, any entity directly or indirectly controlled by the State must be subject to the same procurement rules as it or, at least, have rules of its own informed by international standards of transparency, openness, competition and objectivity, even if none are available domestically.

Secondly, the design and operation of public utilities supplying drinking water and sanitation services are subject to a number of user participation requirements that are summarized in the concept of an open State-owned corporation (see Circular No. 34), whose main objectives are to safeguard the human right to water and sanitation effectively and to democratize management by applying internal directives on independence, transparency and accountability.

In short, the regime applying to the design of State-owned water and sanitation utilities must be that which most effectively ensures compliance with international and constitutional standards in this area. In principle, public law provides better-developed mechanisms for ensuring that service providers operate in a transparent and participatory manner, even if certain specific modifications deriving from private law may be allowed. What can be said is that being subject to public law does not release these companies from the duty of efficiency, since on this depends the effective exercise of the rights of current and potential users, which is the ultimate purpose of the whole system.

*Juan Bautista Justo*



**Challenges and  
opportunities in access  
to water and sanitation  
in rural areas**

Access to drinking water supply and sanitation in rural areas of the region is constrained by local and structural conditions that call for joint action among public, private and community stakeholders. Public action is important to enable the institutional development of the water sector, with a specific focus on catering to the needs of rural areas. International and regional stakeholders also have a crucial role in promoting access to drinking water and sanitation as a human right, a public service and an environmental concern, and also in improving local and global indicators.

The participation of the private sector and civil society requires incentives and opportunities for negotiation to strengthen public-private, public-community and private-community partnerships with long-term effects. In particular, drinking water supply and sanitation markets offer products and services tailored to the needs of rural areas, and corporate social responsibility initiatives leverage local commitments with large impacts.

Rural communities are also both implementers and beneficiaries of programmes and projects for access to clean water supply and sanitation; intervention strategies should therefore envisage wide-ranging community participation, according to their own needs and operation, maintenance, management and payment capacity. Strategies should to be viewed as long-term interventions that provide for post-construction support and community development.

In this context, the emerging challenges and opportunities for better performance and greater access to drinking water and sanitation in rural areas of the region consist in:

- ***Ensuring that more and better information is available for decision-making***, with indicators of water and sanitation coverage, quality and quantity, and data on service delivery levels and the conditions of vulnerable groups in society. Objective and reliable information is essential for the sector to mature, but standards and indicators still need to be consolidated and supplemented by the capacity to report, store and process this information for rural areas.
- ***Coordinating the allocation of tasks between the various public institutions responsible for water and sanitation***. Regulatory frameworks must be consistent with public policies and with management

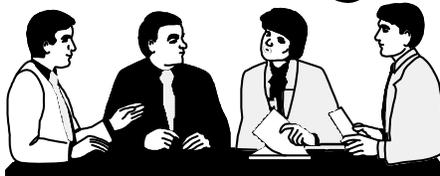
models, and various alternative forms of management (community-based, cooperative and private) may coexist to reflect the diversity of interests and contexts in rural communities.

- **Designing comprehensive, demand-orientated programmes and projects involving communities at every stage.** Drinking water and sanitation programmes need clear rules for projects in terms of funding, implementation phases and support mechanisms for service provision. The demand-orientated approach, combined with a well-informed process of beneficiary area selection, has proven to be an effective way of encouraging communities to take ownership of the infrastructure put in place. Comprehensive assessments of water and sanitation access are good starting points for carrying out subsequent promotion activities, while the pre-investment and investment phases must include mechanisms for active community participation in the decision-making process on appropriate technologies, tariffs and management models.
- **Promoting knowledge management in respect of access to drinking water and sanitation in rural areas.** There is an urgent need to improve the sector's pool of human resources, a process that also requires the involvement of academic institutions. Research and development of appropriate technologies must also become a priority, both in the design of infrastructure and equipment solutions and in management methods, processes and tools. Modern social networks and communities of practice in this field are beginning to yield results, but work is still needed to promote systems of support and horizontal learning.
- **Supporting solidarity initiatives between urban and rural areas.** There is a need for financing, collaboration and territorial development mechanisms that help to conserve water and mitigate pollution, such as river basin agreements. These mechanisms should be supported by public and private institutions that can ensure their long-term sustainability.

The goals for access to drinking water and sanitation proposed in the post-2015 development agenda call for efforts focused on closing the urban-rural gap and overcoming inequities. Improving access to these services in the region is a key factor in local development, but requires financial resources, human talent and social and political will. Intersectoral, intrasectoral, intercultural and inter-institutional cooperation could be the way to achieve these commitments.

*William Carrasco and Andrea Bernal*

# Meetings



The water crisis: proposals based on the Water and Environment Initiative consensuses

Since 2011, the National Association of Private Water Utilities (ANDESS) of Chile, in conjunction with the Department of Environmental Sciences and Renewable Natural Resources of the University of Chile, has been promoting the “*Agua y Medio Ambiente*” (*Water and Environment*) initiative (see Circular No. 35). The initiative has brought together a diverse group of stakeholders in a dialogue that has made it possible to clearly identify areas of agreement and disagreement on various issues concerning Chile's water resources.

The main points of the initiative's assessment are as follows:

- The level of pressure on water resources is a cause for concern.
- The growing relative scarcity of water is intensifying socioenvironmental conflicts over it.
- Water has a variety of functions, but there is a bias towards prioritizing productive functions over other types.
- Lack of long-term multisectoral visions for adapting to conditions of greater scarcity like those expected under climate change.
- The lack of good-quality, timely and verified information on water resources is a basic problem.
- Uncertainty about the ownership of water use rights is a basic and fundamental weakness for sustainable water management.
- The public institutional framework suffers from structural weaknesses that hinder efforts to ensure the sustainable management of water resources.
- Existing organizations of water users are insufficiently developed to ensure good water governance.
- River basins have yet to be recognized as the logical unit for water management.

On 24 July 2014, the seminar entitled “*The water crisis: proposals based on the Water and Environment Initiative consensuses*” was held at ECLAC headquarters. The event was attended by representatives of the legislative and executive branches of government and sponsored by the Senate. The main objective was to engage in a private dialogue with the principal authorities dealing with water-related issues, with a view to improving institutions in the water sector.

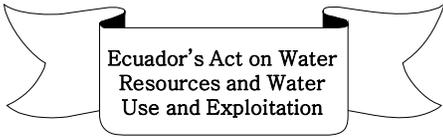


Peru's Compensation Mechanisms for Ecosystem Services Act

On 29 June 2014, Peru passed the **Compensation Mechanisms for Ecosystem Services Act** (Law No. 30215). Its main purpose is to promote, regulate and monitor remuneration mechanisms for ecosystem services deriving from voluntary agreements with provision for conservation, rehabilitation and sustainable use measures to ensure the long-term survival of ecosystems. These mechanisms are defined as systems, tools, instruments and incentives for generating, channelling, transferring and investing financial and non-financial economic resources, where an agreement is entered into between the stewards of ecosystems and those paying for their services, with a view to the conservation, rehabilitation and sustainable use of the sources of these services. Their purpose is to ensure that the benefits generated by ecosystems endure into the future.

The stewards of ecosystem services receive remuneration that is contingent on the implementation of measures for the conservation, rehabilitation and sustainable use of sources of ecosystem services by the paying users. This may be the conservation of natural areas, the rehabilitation of some area that has suffered environmental harm or degradation, or measures to switch the sources of ecosystem services to a sustainable use.

The Unified Register of Mechanisms of Remuneration for Ecosystem Services has been set up, under the management of the Ministry of Environment, to validate, regulate and supervise these mechanisms. This register can be consulted via the National Environmental Information System.



Ecuador's Act on Water Resources and Water Use and Exploitation

In Ecuador, the *Act on Water Resources and Water Use and Exploitation* entered into force on 6 August 2014. It provides that water is a strategic national asset for public use and a vital element of nature that is essential for life and fundamental to food sovereignty, and that ownership thereof is inalienable, perpetual and immune from seizure. Its purpose is to safeguard the human right to water and to govern and oversee the authorization, management, preservation, conservation, rehabilitation, use and exploitation, comprehensive management and recovery of water in its different phases, forms and physical states, with a view to safeguarding “good living” (*buen vivir*) and the rights of nature as enshrined in the Constitution. It is based on the following principles:

- The integration of all forms of water, whether surface, ground or atmospheric, into the hydrologic cycle with ecosystems.
- Water is a natural resource that must be conserved and protected by sustainable management so as to ensure its permanence and quality.
- Water belongs to the public domain and its ownership is inalienable, perpetual and immune from seizure.
- Water is a strategic national asset that serves the needs of citizens and is essential to food sovereignty; accordingly, any form of private ownership of water is prohibited.
- Access to water is a human right.
- The State is the guarantor of equitable access to water.
- It is the State which ensures that water is managed in a comprehensive, integrated and participatory manner.
- Water management is public or community-based.

Water is a national asset, a strategic sector under the exclusive decision-making authority and control of the State acting through the Central Water Authority. Water management must aim to ensure the full exercise of rights and respect for the public interest, in view of its decisive influence over the social, community, cultural, political, environmental and economic spheres.

The Central Water Authority is responsible for the comprehensive and integrated management of water resources with an

ecosystemic approach based on river basins or river basin systems, coordinating this with the various levels of government as their areas of competence dictate. Its director is appointed by the national President and holds the rank of a minister of State.

The Law also set up the Water Regulation and Control Agency (ARCA), which reports to the Central Water Authority. It will be responsible for regulating and overseeing the comprehensive and integrated management of water resources, the quantity and quality of water at its sources and in recharge zones, the quality of water-related public services and all uses and applications of water.

The strategic national water system is the set of processes, institutions and instruments whereby the various social and institutional stakeholders interact to organize and coordinate the comprehensive and integrated management of water resources. It is made up of the Central Water Authority, the Intercultural and Plurinational Water Council, the institutions of the executive branch of government with competences linked to the comprehensive management of water resources, ARCA, the decentralized autonomous governments and the river basin councils.

The Intercultural and Plurinational Water Council is responsible for the formulation, planning, evaluation and participatory monitoring of water resources. The river basin councils are collegiate advisory bodies headed by the Central Water Authority, and their members are the elected representatives of users' organizations. Their purpose is to participate in the formulation, planning, evaluation and oversight of water resources in the river basin concerned.

All forms of water privatization are prohibited because of its importance for life, the economy and the environment. Water cannot therefore be subject to any commercial agreement with a government, multilateral organization or domestic or foreign private-sector company.

The public service of water provision may only be carried out on a public or community basis. Exceptionally, private enterprise and the popular and solidarity economy may be involved in the following cases:

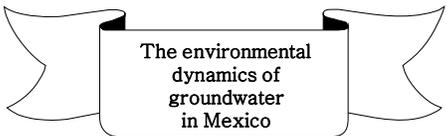
- If a state of emergency is declared by the competent authority.
- If it is needed to implement subprocesses in the administration of the public service because the competent authority does not have the requisite technical or financial resources to do so. Such arrangements may last for a maximum of 10 years, subject to a prior audit.

Nature is entitled to the conservation of water with all its properties as an essential basis for all forms of life. In respect of water conservation, nature is entitled to:

- The protection of water sources, catchment, regulation and recharge zones, aquifer outcrops and natural watercourses, particularly snow-covered mountain areas, glaciers, moorlands, wetlands and mangroves.
- The maintenance of the ecological flow to ensure the preservation of ecosystems and biodiversity.
- The preservation of the natural dynamics of the entire water cycle, or hydrologic cycle.
- The protection of river basins and ecosystems from all forms of pollution.
- The rehabilitation and restoration of ecosystems harmed by imbalances from water pollution and soil erosion.

The State and its institutions are responsible for the integrated management of water resources at the river basin level. They must therefore:

- Promote and guarantee the human right to water.
- Regulate water use and exploitation and measures for preserving water quality and quantity by means of sustainable management based on technical standards and quality parameters.
- Conserve and sustainably manage coastal marine, Andean and Amazonian ecosystems, especially moorlands, wetlands and all ecosystems that store water.
- Promote and strengthen the involvement of organizations of users of public and community water systems in water management through river basin councils and the Intercultural and Plurinational Water Council.
- Recover and promote traditional lore, research and scientific knowledge about the water cycle.



The environmental dynamics of groundwater in Mexico

What follows is a presentation of the conclusions from the report of the “*Groundwater in Mexico*” National Conference (Jiutepec, Morelos, 7 to 9 November 2013), prepared by José Joel

Carrillo Rivera, Alessia Kachadourian Marras and Rafael Huizar Álvarez.

Overall, a static water volume-centred approach predominates, rather than a **hydrogeological vision** reflecting a holistic conception of groundwater in the environment. On the whole, there is incomplete knowledge and understanding of the environmental dynamics of groundwater and its interaction with the environment. Existing systems and paradigms do not provide an understanding of how groundwater functions, and in most cases they have given rise to negative socioenvironmental impacts which are gradually, subtly, imperceptibly and irreversibly jeopardizing the provision of hydrologic ecosystem services to society. One of the reasons for such impacts is the comparatively slow rate of the groundwater response to environmental changes.

In academia, the legal system and technical and administrative circles, **hydrogeological and environmental concepts** are lacking, inadequate or inconsistent. This has led to serious legal distortions that perpetuate inequity and social injustice, while giving rise to a confusing, incomplete language that engenders mutual incomprehension between different fields of knowledge. We must seek to gain a comprehensive grasp of the dynamics of groundwater and its interaction with the other components of the environment. To this end, we must first ascertain which components directly influence these dynamics, which are not constrained by administrative and political boundaries. The correct technical terms should be used properly in all the sectors involved, especially the administrative and legal spheres.

There has been a failure to **record and continuously monitor hydrogeological variables** with national coverage as required for the dynamics and environmental evolution of groundwater to be properly described and understood. Both the type and the spatial and temporal coverage of data are inadequate for the functioning of groundwater to be adequately analysed, and only a handful of institutions are attempting to familiarize themselves with it. This has had two negative consequences: progress is inadequately supported, and agencies responsible for water management are only beginning to apply what new knowledge there is. The information needed to create programmes for managing groundwater and assessing its availability in a manner consistent with the country's hydrogeological situation is in strikingly short supply. Estimates urgently need to be replaced with precise calculations so that hydrogeological conditions and their environmental dynamics can be identified.

The **legal and administrative instruments** relating to groundwater are too weak, as they

are too inconsistent and incompatible with the ultimate goal of guaranteeing the human right to water. The current strategic tools (policies, plans and programmes) and the way in which they are applied have given rise to today's socioenvironmental conflicts. It makes sense to assess these tools and the ability of those who develop and use them as a matter of urgency. At the same time, it is clear that lack of understanding and the difficulties involved in moving towards a holistic view of groundwater flow systems (GFS) are significantly weakening efforts to bring the needed knowledge and understanding of the dynamics of groundwater to the general public as well as to the technical, legal and administrative authorities.

Groundwater is a **critical strategic factor** that transcends specific sectors and localities. Mexico is at a disadvantage in the techniques and methods used to manage its groundwater, a situation that is most worrying in the northern border area. The negative impact of local extraction volumes can be seen in regional and specific environments that are not circumscribed by the currently established limits of river basins. This inconsistency can be grasped by taking the GFS methodology as a standard to define groundwater functioning. Because of the insufficient time and spatial coverage of data and the complicated nature of the environmental systems involved, it is almost impossible to assess the effects and impacts of transboundary water management.

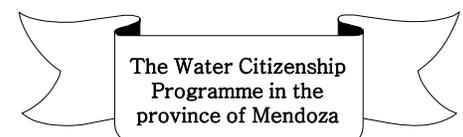
The specific and cumulative **environmental impacts** of the current methods of groundwater extraction on different ecosystems are, by and large, ignored or unknown. This is due to limited understanding of the local and regional workings of groundwater, not only in respect of the amount available for consumption by the population (human-centred perspective), but also from an environmental viewpoint, which can only be considered if the dynamics and interaction of all the biophysical components of related ecosystems are taken into account. Many of these impacts have substantial economic and social implications that could be ascertained and evaluated using GFS hydrogeological criteria.

There is a lack of knowledge and understanding of the current and future cumulative and synergistic **impacts on human health** from ill-considered methods to define available volumes, irrigation returns and from waste management practices. Given intensive and unrestricted extraction of groundwater, its quality cannot necessarily be a limitation when it comes to granting or withholding access to water for the population. Nonetheless, serious effects on human health have been identified from the induction of such elements as fluoride, chromium, manganese and arsenic. This is

coupled with the negative effects on the agricultural sector from the induction of alkaline, sodium-rich water on irrigated land and the continuous run-off of "waste" irrigation water containing agricultural compounds that filters into the groundwater, thus compromising food security in the long run.

**Education** about groundwater is strategic and should be mandatory both in the public education system and at different levels of higher education so that decision-makers and the rest of society can understand the implications involved and the commitments required in the face of the rising water demand entailed by current and future development plans. There is a need for improved teaching of all components of the water cycle, in particular groundwater functioning from an environmental perspective. This holistic analytical methodology needs to be present in the public education system from the preschool to the upper secondary level. University degree courses in fields such as the social sciences, health, law and engineering must also include adequate groundwater information and training components. To transmit this knowledge, actions should be carried out systematically by means of appropriate teaching techniques under a national syllabus, starting with basic educational establishments.

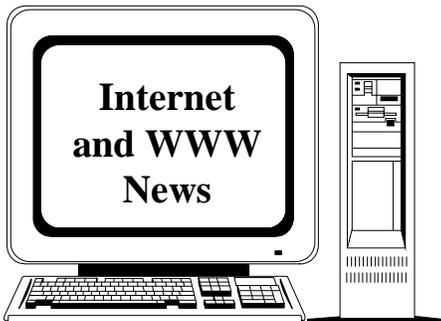
There is also a need to apply the **GFS methodology** as an internationally proven technique providing the key elements needed to generate information, knowledge and hydrogeological understanding of the environmental dynamics of groundwater. Failure to apply knowledge, information, understanding and robust techniques means that the necessary adjustments must be made before scientific methodology can be applied in environmental matters as circumstances require and the rhetoric about water being an element of national security can be put into practice. GFS techniques have been presented as a robust methodology that can address the negative environmental responses observed. This methodology can be used to provide the necessary support to the water balance technique currently also in use in other regions of the world. This approach may also support and be supplemented by ecological flow and other environmental flow methodologies. The GFS concept enriches information on, and knowledge and understanding of the real environmental system being studied.



In the province of Mendoza, Argentina, Law No. 8629 of 8 January 2014 established the **Water Citizenship Programme** of the General

Irrigation Department (DGI), whose objectives are as follows:

- To raise awareness among responsible citizens by providing training in their rights and duties as they relate to water resources.
- To foster the involvement of the community in the promotion and implementation of water management measures.
- To incorporate “water citizenship” into formal and informal education as a cultural and social value, thereby promoting conservation, awareness and efficient use of water.
- To encourage the involvement of young people in promoting and implementing activities that highlight the importance of the proper management and use of water, recognizing them as vital actors in the ongoing promotion of the culture of water as an indispensable element of the province’s identity.
- To devise communication activities that reinforce the values underpinning this programme.



Some websites worth visiting for information on water-related issues are listed below:

- Issue number three of *Agua y Territorio* magazine was recently published. It contains several articles on water resources in Portugal and Latin American countries, including in particular one entitled “*Políticas latinoamericanas en la gestión del agua: de la gobernanza neoliberal a una gobernanza pública*” (*Latin American policies in water management: from neoliberal to public governance*) (<http://revistaselectronicas.ujaen.es>).
- On 19 January 2014, Peru passed the **Water Users’ Organizations Act** (Law No. 30157), which governs the establishment and operation of water users’ organizations as provided for in the Water Resources Act (see Circular No. 30) (<http://gsagua.com>).
- The main role of the **World Meteorological Organization (WMO) Project Office in Mexico** is to support the

planning, coordination and implementation of activities undertaken within the framework of the Technical Cooperation Agreement between the Government of Mexico and the WMO with a view to promoting, fostering and strengthening the integrated and sustainable water management (<http://www.omm-mex.info>).

- In Chile, the **Promotion of Private Investment in Irrigation and Drainage Works Act**, administered by the National Irrigation Commission (CNR) (see Circulars Nos. 14 and 21), was amended by Law No. 20705 (<http://www.cnr.cl>). This reform will make it possible to launch multipurpose projects to benefit the different production sectors. The objective is to make more rapid progress in constructing water infrastructure with a view to improving agricultural output in a context of water scarcity.
- The mission of **ANDESS** (see “**Meetings**”) is to represent Chile’s drinking water supply and sewerage industry, as a contributor to economic development and environmental protection. Its website (<http://www.andess.cl>) contains material on its activities and interesting studies, such as the “*Informe de Gestión de la Sequía 2014*” (*Report on the management of the 2014 drought*) and “*Desalinización como nueva fuente de agua para la producción de agua potable*” (*Desalination as a new water source for drinking water production*).
- Issue 42 of *esPosible* magazine analyses the roles played by community water boards in access to safe drinking water supply and sanitation in Central America (<http://www.revistaesposible.org>).
- **Justicia Hídrica/Water Justice** is an international alliance, working on research, capacity-building and action. Its objective is to promote greater water justice in the form of democratic water policies and sustainable development practices that promote more equitable water distribution (<http://justiciahidrica.org>).
- The Regulatory Commission for Drinking Water and Basic Sanitation (CRA) of Colombia has published a paper entitled “*20 Años. Regulación de los servicios públicos domiciliarios de acueducto, alcantarillado y aseo en Colombia*” (*20 years. Regulation of public household water supply, sewage and waste disposal services in Colombia*) that outlines the main achievements of its regulatory work for the provision of drinking water supply, sewerage and waste disposal services and the principal economic regulation challenges it expects in the future (<http://www.cra.gov.co>).

- The **Food, Energy, Environment and Water (FE<sup>2</sup>W) Network** is “bridging the silos” across the fields of food, energy, environment and water, which are essential to human well-being and to environmental health, in order to improve living conditions (<http://www.fe2wnetwork.org>).
- The website of the **Andean Development Corporation** (CAF) contains a number of interesting water-related publications, such as “*Equidad e inclusión social en América Latina: acceso universal al agua y el saneamiento*” (*Equity and social inclusion in Latin America: universal access to water and sanitation*), “*Ríos de integración. El camino fluvial de América Latina*” (*Rivers of integration. Latin America’s river pathway*) and “*La Infraestructura en el Desarrollo Integral de América Latina*” (*Infrastructure in the comprehensive development of Latin America*) (<http://www.caf.com>).
- Materials from the seminar “**Climate change impacts, vulnerability and adaptation: findings of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change**” (Santiago, Chile, 29 April 2014) is available at <http://cambioglobal.uc.cl>.
- **Watershed Connect** is an online platform connecting practitioners, policy-makers, and other stakeholders interested in investing in natural water infrastructure. It serves as a centralized space to learn and share news and analyses, join relevant social media discussions, access resources and tools, and research efforts on payments for watershed services and water quality trading (<http://watershedconnect.org>).
- The **Water Authority of the province of Buenos Aires**, Argentina, is an autonomous, multidisciplinary body under public law that is responsible for the planning, registration, establishment and safeguarding of rights, together with policymaking and performance of the functions laid down in the regulatory framework for the water sector (<http://www.ada.gba.gov.ar>).
- **New Water Policy and Practice Journal** is available at <http://www.ipsonet.org>.
- **Understanding the Energy-Water Nexus** report aims to inform local and regional decision-makers responsible for the development and implementation of policies related to energy and water resource systems (<http://www.ecn.nl>).
- The mission of Ecuador’s **Water Secretariat** is to preside over the comprehensive and integrated water resources management by means of

policies, standards, monitoring and decentralized administration to ensure that water is used in an efficient manner (<http://www.agua.gob.ec>).

- ECLAC (<http://www.cepal.org>) has published the third edition of its **Handbook for Disaster Assessment**, which updates its methodology for estimating the consequences of a disaster, while explaining how to distinguish clearly between losses and additional costs and systematize the links between different sectors of the economy.
- The objective of the “**Agua que has de beber**” (*Water you have to drink*) initiative is to strengthen the capacity of civil society organizations and local authorities in Chile to act and engage in dialogue so that they can participate in drawing up and implementing poverty reduction and socioeconomic development strategies (<http://www.aguaquehasdebeber.cl>).
- “**Thirsty Energy: Securing Energy in a Water-Constrained World**”. This publication introduces the energy-water nexus, examines the water requirements of power generation and presents some potential technical and institutional solutions for improving the management of the nexus (<http://www.worldbank.org>).
- Documentation from the workshop “**Studying the potential for expanding irrigation in Argentina**” (Buenos Aires, 28 April 2014) can be consulted at <http://www.fao.org>.
- CRA Resolution No. 688 of 2014 “**Establishing a tariff methodology for providers of public household water supply and sewerage services with more than 5,000 subscribers in urban areas**” has been published (<http://www.cra.gov.co>).

# Publications



Recent publications of the Natural Resources and Infrastructure Division:

- “**Políticas e institucionalidad en materia de agua potable y saneamiento en América Latina y el Caribe**” (*Policies and institutional frameworks for water and sanitation in Latin America and the Caribbean*) (*Natural Resources and Infrastructure Series* No. 166, LC/L.3822, May 2014) by Franz Rojas (available in Spanish only). This document gives details of public policies for water and sanitation in 22 countries in the region, outlining their regulatory frameworks, sector plans and applicable institutional frameworks. Many countries have reformed the institutional structure of the sector with a view to the institutional separation of governance and sectoral policymaking responsibilities from economic regulation and service provision functions. However, several of them still need to update the legal framework of the sector to adapt it to the new conditions, constitutional changes and emerging challenges. For instance, the separation of institutional functions is still incipient in certain countries. Another trend is the decentralization of service provision, almost always to the municipal level. In many cases, again, policies have been adopted with a view to depoliticizing service management, with more technical and commercial criteria. However, the corporate governance of many public utilities remains heavily dependent on the

executive branch, which undermines their autonomy. As regards plans and goals, a number of countries have high levels of nominal coverage and some even aspire to universal service provision in the coming years. Nonetheless, some of them will probably fail to meet the MDG target for access to drinking water. The situation with sanitation is more critical. Given this, the region needs to step up the pace of implementation and improve the quality of investments, which requires advocacy work and improved implementation capacity and efficiency. The picture is complicated by the absence or poor quality of information on the status of systems, users’ ability to pay and actual investment needs. The sustainability of investments is an equally important aspect that is not reflected to the same degree in the countries’ plans and institutions. Lastly, there are descriptions of best practices in each country, aimed at improving institutional frameworks, closing regulatory gaps and promoting alternative investment systems and delivery models that exploit economies of scale, as well as public policies designed to conserve water resources and protect the environment.

- “**Boas práticas de regulação dos prestadores públicos de serviços de água e esgoto**” (LC/W.542, October 2014) by Sanford Berg. Portuguese translation of the study “*Best practices in regulating State-owned and municipal water utilities*” (see Circular No. 39).

The publications of the Natural Resources and Infrastructure Division are available in two formats: (i) electronic files (PDF), which can be downloaded from <http://www.eclac.org/drni> or requested from [Caridad.CANALES@cepal.org](mailto:Caridad.CANALES@cepal.org); and (ii) printed (hard) copies, which should be requested from the Publications and Web Services Division (e-mail: [publications@cepal.org](mailto:publications@cepal.org), fax: (56-2) 2208-0252, or post: Casilla 179-D, Santiago, Chile).

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